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Olena G. Glazunova

Doctor of Pedagogical Sciences, Professor,
National University of Life and Environmental Sciences of Ukraine, Kyiv, Ukraine
ORCID 0000-0002-0136-4936
o-glazunova@nubip.edu.ua

Olena G. Kuzminska

PhD of Pedagogical Sciences, Associate Professor
National University of Life and Environmental Sciences of Ukraine, Kyiv, Ukraine
ORCID 0000-0002-8849-9648
o.kuzminska@nubip.edu.ua

Nataliia V. Morze

Doctor of Pedagogical Sciences, Professor,
Corresponding Member of National Academy of Educational Sciences of Ukraine,
Vice-Rector on Informational Technologies Borys Grinchenko Kyiv University, Kyiv, Ukraine
ORCID ID 0000-0003-3477-9254
n.morze@kubg.edu.ua

Tetiana V. Voloshyna

PhD of Pedagogical Sciences,
National University of Life and Environmental Sciences of Ukraine, Kyiv, Ukraine
ORCID 0000-0001-6020-5233
t-voloshyna@nubip.edu.ua

USING SCIENTIFIC E-CONFERENCES FOR THE RESEARCH COMPETENCE DEVELOPMENT: STUDENTS' POINT OF VIEW

Abstract. The article discusses the methodology of using a scientific electronic conference for the development of research competence of university students. A model of the use of a scientific electronic conference for the development of students' research competence was developed. It includes the following components: purpose, procedural, content-technological, diagnostic. It is proposed to use a process approach for the development of research competence through electronic scientific conferences. The purpose, activities, means, forms, methods and research skills that will be formed as a result of each process were determined. The system of indicators was developed to determine the level of research competence for such constituents as: methodology, information search, problem solving, quantitative analysis and communication. The types of activities occurring at each stage of the process are determined, in particular, the means and electronic content used for their implementation, the forms and methods of efficient use of electronic means, competences that are formed during the implementation of the model. Stages of students' preparation for and participation in an electronic conference in cooperation with lecturers and experts (reviewers) that will form not only the research competence of students, but also their digital competence (digital literacy) are presented. The efficiency of using scientific electronic conferences as an instrument for the development of students' research competence has been proved. In particular, the results of the student survey on the development of constituents of research competence are presented. The students of the National University of Life and Environmental Sciences of Ukraine and Borys Grinchenko Kyiv University who have an intermediate and high level of research competence have noted the positive impact of lead-up and participation in scientific e-conferences on the development of students' research competence.

Keywords: university students; scientific e-conference; research competence; open conference systems; education.

1. INTRODUCTION

The problem statement. The integration of education and science at the institutional, regional and global levels is a generator of scientific knowledge and a basis for innovation development. To ensure the integration of university education and science, it is necessary to develop students' and teachers' special competences [1]. Among these competences we should mention digital literacy [2] in educational activities, research and scholarly communication [3].

Analysis of recent studies and publications. The organization of students' research work is an important component of their professional training.

T. Meerah et al. [4], [5], A. Sirkka and J. Cap [6], F. Bottcher and F. Thiel [7] investigated the structure of research competence, which includes such skills as: information search, systemic collection, analysis and interpretation of data, problem solving, methodological skills, communication skills.

Conducting conferences at the university encourages students and teachers to disseminate information about the results of their own research. Also, such conferences give students the opportunity to present the results of their graduation projects. Students have the opportunity to participate in regional and international conferences in order to develop their scientific careers, search for potential mentors, projects, laboratories and institutions for scientific collaboration.

E-conferencing systems have a great potential for scientific online communication that will foster the development of students' digital literacy and effective management of their scientific activities. K. Daimi [8] and A. Amirah et al. [9] presented research on Designing an Online Conference Management System, which provides an easier way of managing events when conducting a conference.

The goal of the article is to identify the impact of lead-up and participation in scientific e-conferences on the development of students' research competence.

2. THE RESULTS AND DISCUSSION

2.1. E-conference: pedagogical potential in the development of research competence

The readiness to use e-conferences in higher educational institutions (HEIs) is defined by the level of digital competence of educators and students who can perform different roles in the organization of conferences [10]. According to the results of the study on Digital Competence of the Students and Educators in Ukraine [11], the educators and students have above the average level of usage of digital tools and communications. Thus, we assume that Ukrainian educators and students are ready to use electronic systems for supporting conferences.

The Open Conference Systems (OCS) - an open source software platform was chosen to conduct online conferences at the National University of Life and Environmental Sciences of Ukraine. The main functions of this platform include: creating a conference website, registering conference participants, sending publications and presentations of performances, electronically accepting and posting conference materials, reviewing reports, editing reports, conducting online discussions after the conference. The platform configuration system allows its users to create multiple conferences, appoint conference presidents and teams for various conference calls (Fig. 1).

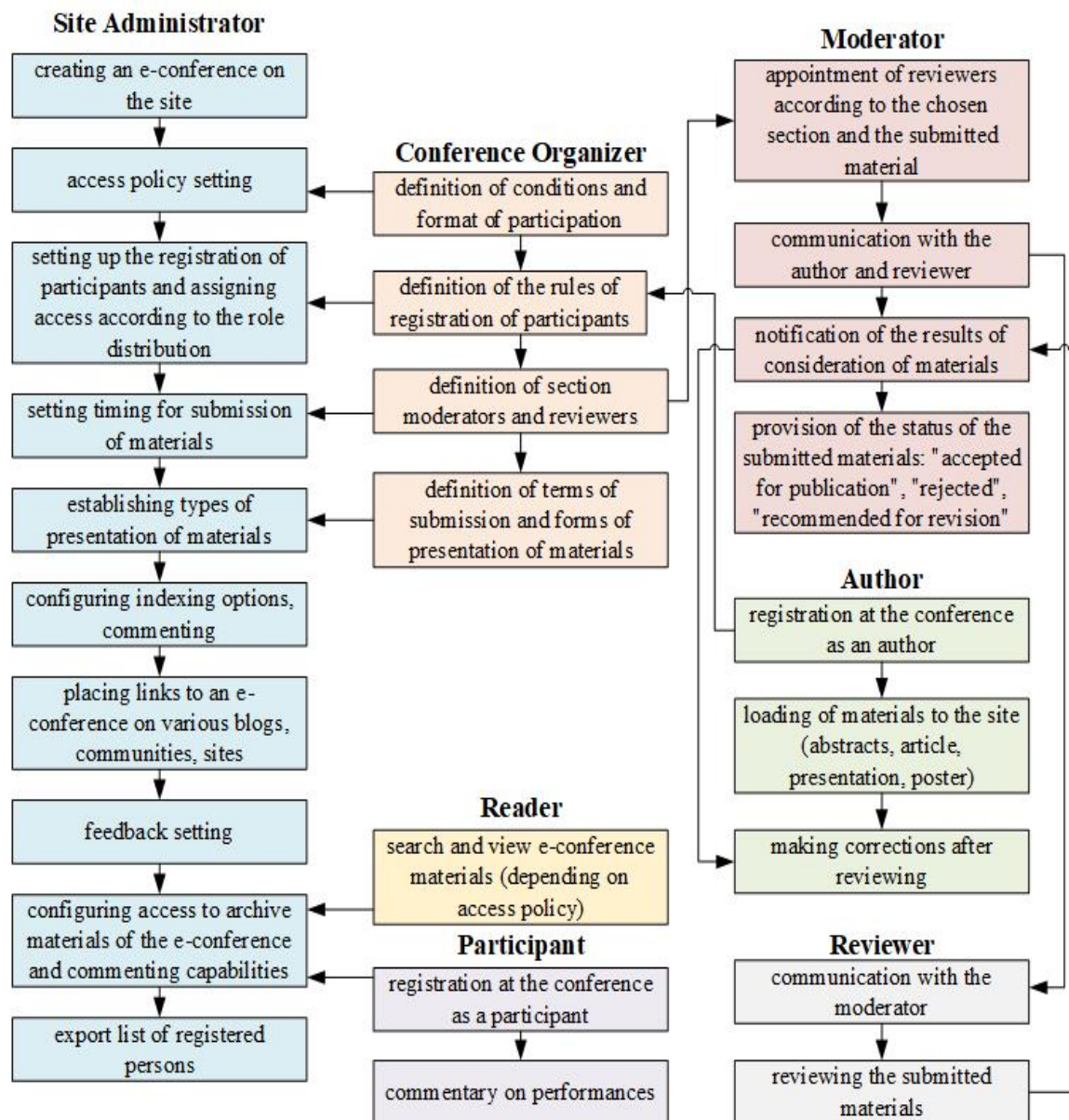


Fig. 1. Functions of performers in Open Conference Systems platform

University teachers or young scientists with experience in the organization of scientific conferences may be moderators of an e-conference. There may be specialists (preferably independent) relevant to the conference as reviewers. The section moderator communicates with the author of the submitted materials directly by e-mail, using the conference site, and the reviewer indirectly (through the moderator of the section), because the blind review is used.

At each stage of the preparation and participation in the e-conference the students, lecturers and experts (reviewers) cooperate in such a way as to form not only students' research competence, but also digital competence (ICT Literacy, digital literacy). Submitting an article using the e-conference is presented in Fig. 2. For other tasks it is possible to use other tools and instruments [10].

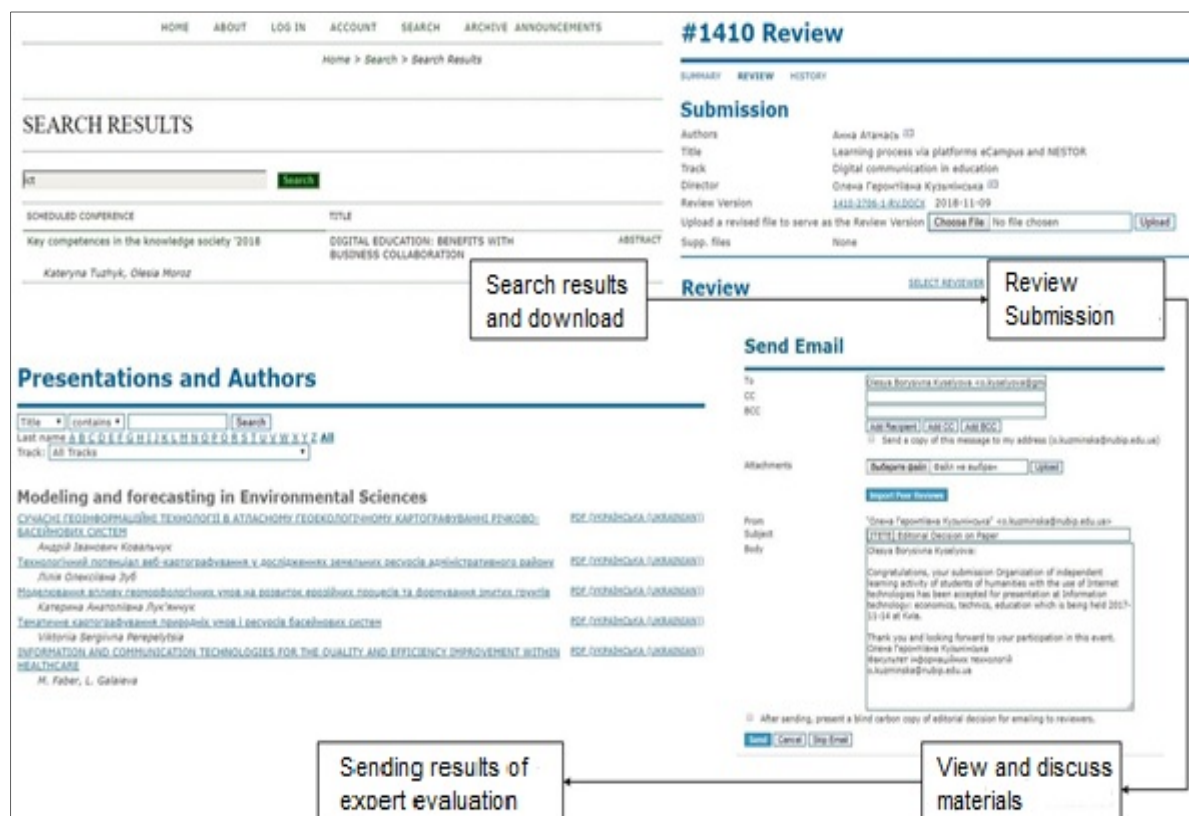


Fig. 2. An example of submitting the paper by using e-conference

2.2. The Model of Using Scientific E-Conference for the Development of Students' Research Competence

The main objective of the developed model is the development of the students' research competence by means of systemic usage of such a tool as a scientific e-conference (Fig. 3). At the same time, the requirements to the professional competence of HEI graduates, the standards of their preparation and the necessity of training scientific manpower for different branches were the determining factors in the development of this model.

In this study, the following skill groups of research competence are used [5], [4]: methodology skills, information seeking skills, problem solving skills, quantitative analysis skills, communication skills. Project, research, individual and group methods are used for their development with the use of scientific e-conferences. These components are described in detail in [10].

In accordance with the mentioned regulatory factors, in particular, the curricula, it is necessary to form students' skills to explore new scientific hypotheses, analyze the results of research. Such skills that are part of the research competence structure and can be developed as a result of the student's participation in scientific e-conferences fully correspond to the "Education technology standards to transform learning and teaching (ISTE)". In particular, the definition of research competence and indicators for measuring student's competence are given in [12]. This standard includes 7 components: 1) Empowered learner; 2) Digital citizen; 3) Knowledge Constructor; 4) Innovative; 5) Computational; 6) Creative Communicator; 7) Global Collaborator.

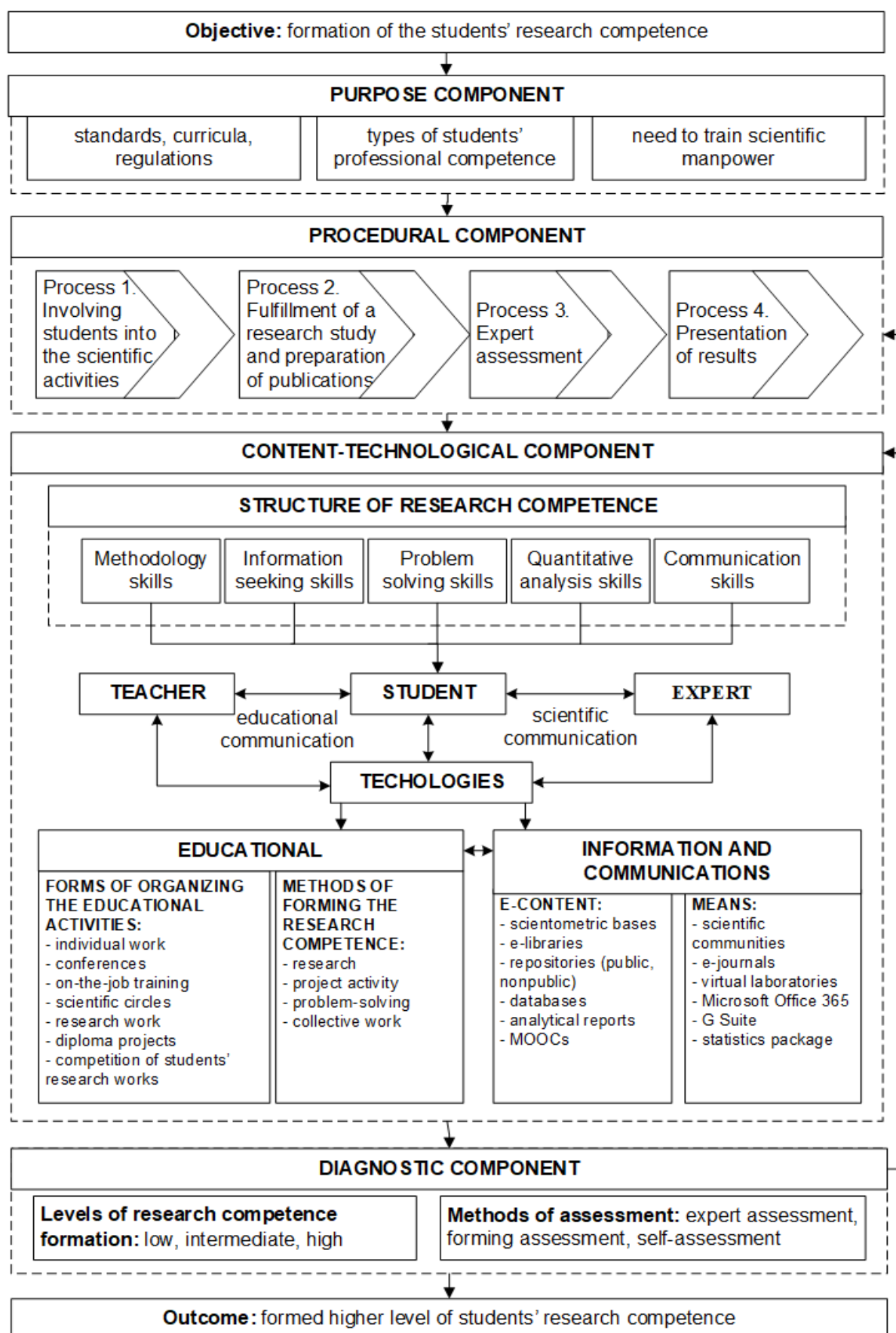


Fig. 3. The model of using scientific e-conferences for the development of students' research competence

The main processes that are carried out during the preparation and participation in a scientific e-conference can be defined as follows: 1) The process of involving students in scientific activities; 2) The process of preparing the publication; 3) Expert assessment; 4) Presentation of the results. The process of involving students in scientific activities through participation in e-conferences involves motivating students to find the latest developments in the subject field they are studying. In particular, students are encouraged to register with the scientific community, to familiarize with various sites of e-conferences, e-journals, to familiarize themselves with the results of previous researches and identify the problem for their own research. In the process of preparation for and participation in a conference the students perform the following tasks: define the subject of the report and submit it to the scientific advisor for approval; prepare the paper (abstract, article); check it for plagiarism; submit their paper for expert assessment; prepare the findings in the form of presentation; participate in the conference. At each stage, when performing certain activities, students acquire professional, research, information and communication competence. In the process of expert assessment, the students send their prepared paper, receive reviewers' comments, communicate with the editor (reviewer), make a decision on introducing changes to the text. For the presentation of the outcomes the students elaborate the speech structure and prepare a visual demonstration in line with the requirements of the target audience.

Table 1 defines in more detail types of activities which are carried out at each stage of the corresponding process. For each activity tools and electronic content, forms and methods for the effective use of electronic tools, research skills, formed in the process of implementation of the relevant process, are proposed. The educational and scientific communication can be organized within the academic cloud of the university, one of the components of which is the system of scientific e-conferences [13]. As a rule, university academic clouds operate on a hybrid model. In such a cloud, a student can access full-text versions of works published in scientometric databases, e-journals, e-libraries and repositories. In addition, to make students' research more effective, tools for communication and collaboration (for example, Microsoft Office 365), the implementation of mathematical and statistical calculations (for example, R-studio, SPSS), virtual laboratories for modeling, programming, data analysis and the like may be placed in the cloud.

Table 1

Process approach to the use of scientific e-conferences for the development of research competence

Process 1. Involve students in scientific activities	Objective: to use e-conferences to involve students in research	
	Activity	Analysis of sites of scientific e-conferences; search for outcomes of research of the chosen problem on sites of e-conferences; discussing the needs for research and dissemination of results, identifying promising directions (subjects) of research in a particular field of science, identifying the benefits of open access to research;
	Forms	Scientific circles, conferences, competitions of student's scientific works, project work within the discipline;
	Methods	Research, problem-solving
	E-content	E-libraries, repositories (public, nonpublic), MOOCs
	Tools	Scientific communities
	Research skills	Information seeking skills: I1; I3 Communication skills: C2; C4
	ISTE	1. Empowered Learner: 1A.
	Outcomes: Formulation of the problem (according to the line of research)	

Process 2. Carrying out research and writing the article	Objective: to conduct research and prepare publications for participation in the scientific e-conference	
	Activity	The choice of the topic; formulation of the title; definition of paper structure; drawing up a plan; definition of the goal, methodology of research and ways of solving the problem; analysis of the data obtained during the study; selection of necessary sources of information; choice of methods and argumentation of necessity and specificity of their use; formulation of conclusions, data consolidation and generalization; preparation of the academic paper in accordance with the requirements of the conference
	Forms	Independent work, research work, graduation projects, conferences, competitions of students' scientific works
	Methods	Research, problem-searching, collective work
	E-content	Scientometric databases (Web of Science, Scopus, EBSCO, Google Scholar), databases, analytical reports, e-libraries, repositories
	Tools	Communication (Outlook, Calendar, Skype, Meet, Hangouts), collaboration (One Drive, Google Drive, OneNote), cooperation (Forms, Planner), statistical data analysis (MS Excel, SPSS, Power BI), platforms supporting scientific conferences (Open Conference Systems), International abstract and citation database: Web of Science, Scopus, EBSCO, Google Scholar
	Research skills	Methodology skills: M2; M4; M5 Information seeking skills: I2; I1; I3; I4 Quantitative analysis skills: Q1; Q3; Q4; Q5 Problem solving skills: P1; P2; P3; P4; P6
	ISTE	1. Empowered Learner: 1A.; 2. Digital citizen: 2A., 2C.; 3. Knowledge Constructor: 3A., 3B., 3C.; 4. Innovative Designer: 4A, 4D.; 5. Computational Thinker: 5A, 5C.
Outcome: Creation of an academic paper according to the line of research		
Process 3. Expert evaluation of materials	Objective: to use the e-conference system to support expert assessment of materials	
	Activity	Sending a prepared paper; receiving reviewers' comments; communicating with the editor (reviewer); making a decision on introducing changes to the work
	Forms	On-line communication
	Methods	Research, collective work
	E-content	Analytical reports
	Tools	E-conference, Microsoft Office 365, G Suite
	Research skills	Communication skills: C1; C2; C3 Problem solving skills: P2; P3; P4
	ISTE	2. Digital citizen: 2A., 2B.; 7. Global Collaborator: 7B., 7D.
Outcome: reviewing and editing an academic paper		

Process 4. Presentation of outcomes	Objective: to use e-tools for presentation of results and their publication in scientific communities	
	Activity	Elaboration of the speech structure and preparation of the visual demonstration in line with the requirements of the target audience
	Forms	E-presentation, report
	Methods	Project activity, collective work
	E-content	Scientometric databases (Web of Science, Scopus, EBSCO, Google Scholar), MOOCs
	Tools	Scientific communities, e-magazines, tools for preparing presentations: Cacao, Mindomo, PowerPoint, Sway, Prezi, Google Presentations, Piktochart, Canva, Calameo, Youtube, Stream
	Research skills	Problem solving skills: P1; P2; P4; P5 Communication skills: C2; C3; C4
	ISTE	5. Computational Thinker: 5C. 6. Creative Communicator: 6C, 6D.
	Outcome: preparation of the presentation (poster) of the speech based on the submitted academic paper	

The use of e-conferences for the development of students' research competence results in its increased level achieved through the application of a mix of forms, methods, ICT technologies (e-tools and e-content) in accordance with the proposed process approach.

2.3. Research Outcomes: The impact of Scientific E-Conferences on the Development of Students' Research Competence

Our research was carried out in the National University of Life and Environmental Sciences (NULES) of Ukraine and Borys Grinchenko Kyiv University during 2013-2017. The model of using scientific e-conferences for the development of students' research competence developed by the authors (Fig. 3) has been tested within the framework of annual e-supported conferences of young scholars, among them:

- <http://econference.nubip.edu.ua/index.php/itete/VIII/index>;
- <http://conf.kubg.edu.ua/index.php/it/2017#.W6nWyKNgE1I>.

The results of the statistical analysis of the data obtained during the experiment in the National University of Life and Environmental Sciences (NULES) of Ukraine are described in [10].

In order to determine the impact of the students' lead-up and participation in e-conferences on the development of certain skills groups of research competence, a survey was conducted involving 54 students from NULES of Ukraine (33 students) and Borys Grinchenko Kyiv University (21 students). These are students who according to the results of the experiment have an intermediate and high level of research competence.

The first block of the survey contained personal data of the participants, including the number of conferences in which the respondent participated. 75% of students who demonstrated high and intermediate level of research competence participated in at least 4 academic conferences. Thus, we can speak about the expert level of respondents in determining the impact of participation in e-conferences on the development of research competence.

The second block of questions was designed for the evaluation of the impact of participation in scientific e-conferences on the development of research competence individual skills. 54 respondents evaluated the impact on each skill group of the research

competence (Table 2) by the following scale: 0 (absent), 1 (insignificant), 2 (significant), 3 (defining).

Table 2

Impact of participation in scientific e-conferences on the development of research competence individual constituents

Skills and Indicators of research competence	Distribution of expert assessments				Total	Weight
	0	1	2	3		
Methodology Skills (M)						
M1. Understands the content of the research stages	22	24	6	2	42	0.29
M2. Correctly applies research methods	9	10	25	10	90	0.56
M3. Is able to substantiate methodological approaches to the research	19	26	9	0	44	0.27
M4. Understands the notion of the experimental data samples	16	24	14	0	52	0.32
M5. Is able to determine the hypothesis of the study, subject and object of the study	22	21	11	0	43	0.26
Information seeking Skills (I)						
I1. Is able to effectively seek materials on the topic of research	23	24	7	0	38	0.23
I2. Uses abstract and citation database for information search	15	26	13	0	52	0.32
I3. Is able to analyze and critically evaluate materials from a variety of sources	3	5	13	33	130	0.8
I4. Correctly cites information sources	12	18	21	3	69	0.43
Problem solving Skills (P)						
P1. Is able to define the research problem and tasks for solving it	17	29	8	0	45	0.28
P2. Is able to evaluate problem solving options and choose the most effective one	6	6	33	9	99	0.61
P3. Can offer a new way to solve the problem	22	19	11	2	47	0.29
P4. Demonstrates analytical skills to examine the consequences of a particular solution, and reasoning skills to weigh one solution against another	2	6	29	17	115	0.71
P5. Demonstrates the skills of imagination and creativity while addressing the research problem	26	17	11	0	39	0.24
P6. Is able to conduct scientific experiments	25	29	0	0	29	0.18
Quantitative analysis Skills (Q)						
Q1. Is able to carry out data collection procedures involving planning and selecting appropriate data collecting tools or instruments	28	17	9	0	35	0.22
Q2. Identifies an appropriate method (quantitative and qualitative) for interpreting and manipulating data	29	16	9	0	34	0.21

Q3. Applies appropriate statistical tools for testing the research significance in addition to understanding	29	22	3	0	28	0.17
Q4. Realizes limitations of analysis techniques (for example, understands the assumptions behind a statistical analysis, and examines whether your data fit these assumptions)	17	26	9	2	50	0.31
Q5. Draws and interprets appropriately the conclusions from results of analysis	4	8	35	7	99	0.61
Communication Skills (C)						
C1. Is able to present the results of research	1	6	11	36	136	0.84
C2. Can communicate to others the purpose and outcomes of the research	0	5	11	38	141	0.87
C3. Is able to summarize information, explain the purpose, objectives, conclusions of the research	0	0	11	43	151	0.93
C4. Can tailor the communication to the needs and knowledge level of a particular audience	0	5	11	38	141	0.87

To verify the consistency of respondents' responses, Kendall's rank concordance coefficient is used, since it is the only one that reflects the consistency of the opinion of the expert group as a whole [14]. According to the respondents' surveys, the calculated concordance coefficient is $W = 0.73$. Thus, the coefficient is significant, that is, the consistency between the experts is sufficient. Therefore, we can conclude that participation in the preparation of materials and presentation of research results at scientific conferences with the help of the OCS system promotes, first of all, the development of such constituents of research competence: Communication (C1-C4), Information seeking (I3), Problem solving (P2, P4), Quantitative analysis (Q5) and Methodology (M2) (Fig. 4).

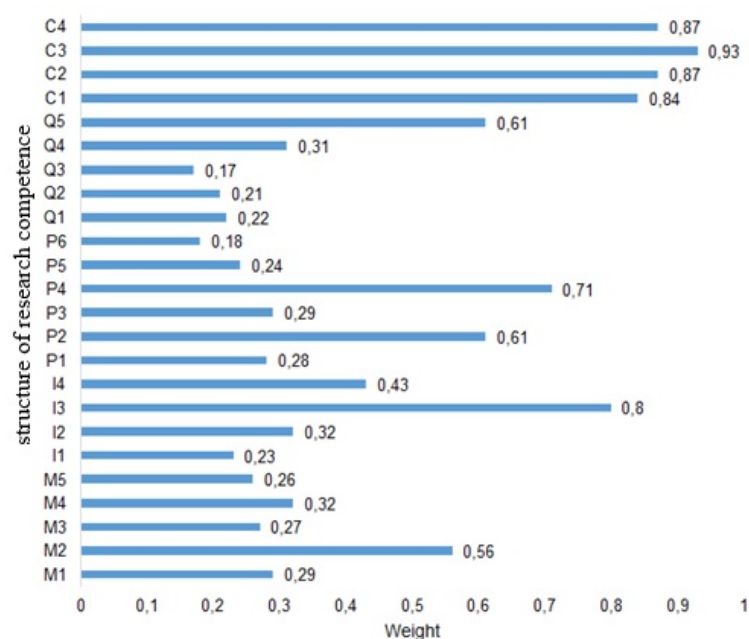


Fig. 4. Impact of participation in scientific e-conferences on the development of research competence constituents

Therefore, in view of the experience and the results of the students' reflection on participating in scientific e-conferences, further research should focus on the forms and methods that make it possible to increase the level of development of other components of research competence.

3. CONCLUSIONS AND FURTHER RESEARCH PROSPECTS

When performing each stage of preparation for participation in a scientific conference, students find and analyze professional-oriented materials, search for the optimal solution of the problem, learn to substantiate and analyze alternative hypotheses, find solutions to problems, present research results and discuss research issues. The developed indicators measuring students' research competence can be used to determine the level of its development.

Applying a process approach to the development of students' competence through e-conferences involves not only the preparation of materials and their presentation, but also the involvement of students in scientific activity, the study of promising areas of the defined scientific research, an analysis of the state of development of scientific issues at the national and world level. Moreover, the use of the OCS platform as information support for holding e-conferences creates opportunities for equal access of students to conferences. Students also have an opportunity to explore the leading edge of the discipline, while making connections in the scientific community can be of huge benefit for an undergraduate interested in embarking on a scientific career.

The results of a student survey held in two universities of Ukraine are the basis for determining the effectiveness of the use of e-conferences in shaping students' research competence. Students who have a intermediate and high level of research competence have noted the positive impact of lead-up and participation in scientific e-conferences on the development of students' research competence individual skills.

Further research on the development of skill groups of research competence may be associated with the search for new technologies and methods for the organization of scientific communication, cloud services for research, processing and analysis of data.

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ВИКОРИСТАННЯ НАУКОВИХ Е-КОНФЕРЕНЦІЙ ДЛЯ РОЗВИТКУ ДОСЛІДНИЦЬКОЇ КОМПЕТЕНТНОСТІ: ТОЧКА ЗОРУ СТУДЕНТІВ

Глазунова Олена Григорівна

доктор педагогічних наук, професор, декан факультету інформаційних технологій
Національний університет біоресурсів і природокористування України, м. Київ, Україна
ORCID 0000-0002-0136-4936
o-glazunova@nubip.edu.ua

Кузьмінська Олена Геронтіївна

кандидат педагогічних наук, доцент, завідувач кафедри інформаційних і дистанційних технологій
Національний університет біоресурсів і природокористування України, м. Київ, Україна
ORCID 0000-0002-8849-9648
o.kuzminska@nubip.edu.ua

Морзе Наталія Вікторівна

доктор педагогічних наук, професор, член-кореспондент НАПН України,
проректор з інформатизації навчально-наукової та управлінської діяльності
Київський університет імені Бориса Грінченка, ректорат, м. Київ, Україна
ORCID ID 0000-0003-3477-9254
n.morze@kubg.edu.ua

Волошина Тетяна Володимирівна

кандидат педагогічних наук, старший викладач кафедри інформаційних і дистанційних технологій
Національний університет біоресурсів і природокористування України, м. Київ, Україна
ORCID 0000-0001-6020-5233
t-voloshina@nubip.edu.ua

Анотація. У статті розглянуто методику використання наукових електронних конференцій з метою формування дослідницької компетентності студентів університету. Авторами розроблено модель використання наукової електронної конференції для формування дослідницької компетентності студентів, яка містить такі компоненти: цільовий,

процесуальний, змістово-технологічний, діагностично-результативний. Запропоновано використати процесний підхід для розвитку дослідницької компетентності з використанням наукових е- конференцій. Для кожного процесу визначено мету діяльності, засоби, форми, методи та складові дослідницької компетентності, які будуть сформовані в результаті. Розроблено систему індикаторів для визначення рівня дослідницької компетентності за такими складовими: методологія, інформаційний пошук вирішення проблем, аналіз даних, комунікація – і визначено рівні формування дослідницької компетентності студентів. Представлено етапи підготовки та участі студентів у конференціях із застосуванням відкритих систем підтримки е-конференцій. Запропоновано приклади е-контенту та додаткових ІК-інструментів для системного формування дослідницької компетентності студентів та розвитку цифрової компетентності (ІКТ грамотності). Доведено ефективність використання наукових електронних конференцій як інструменту формування дослідницьких компетентностей студентів, зокрема представлено результати опитування студентів двох університетів щодо формування окремих складових дослідницької компетентності. Студенти НУБіП України та Київського університету імені Бориса Грінченка, які мають середній та високий рівень дослідницької компетентності, відзначили позитивний вплив підготовки та участі в наукових електронних конференціях на розвиток індивідуальних дослідницьких навичок.

Ключові слова: наукова е-конференція; дослідницька компетентність; відкриті системи конференцій; освіта.

ИСПОЛЬЗОВАНИЕ НАУЧНЫХ ЭЛЕКТРОННЫХ КОНФЕРЕНЦИЙ ДЛЯ РАЗВИТИЯ ИССЛЕДОВАТЕЛЬСКОЙ КОМПЕТЕНТНОСТИ: МНЕНИЕ СТУДЕНТОВ

Глазунова Елена Григорьевна

доктор педагогических наук, профессор, декан факультета информационных технологий
Национальный университет биоресурсов и природопользования Украины, г. Киев, Украина
ORCID 0000-0002-0136-4936
o-glazunova@nubip.edu.ua

Кузьминская Елена Геронтиевна

кандидат педагогических наук, доцент,
заведующий кафедрой информационных и дистанционных технологий
Национальный университет биоресурсов и природопользования Украины, г. Киев, Украина
ORCID 0000-0002-8849-9648
o.kuzminska@nubip.edu.ua

Морзе Наталья Викторовна

доктор педагогических наук, профессор, член-корреспондент НАПН Украины,
проректор по информатизации учебно-научной и управленческой деятельности
Киевский университет имени Бориса Гринченко, ректорат, г. Киев, Украина
ORCID ID 0000-0003-3477-9254
n.morze@kubg.edu.ua

Волошина Татьяна Владимировна

кандидат педагогических наук,
старший преподаватель кафедры информационных и дистанционных технологий
Национальный университет биоресурсов и природопользования Украины, г. Киев, Украина
ORCID 0000-0001-6020-5233
t-voloshina@nubip.edu.ua

Аннотация. В статье рассмотрена методика использования научных электронных конференций с целью формирования исследовательской компетентности студентов университета. Авторами разработана модель использования научной электронной конференции для формирования исследовательской компетентности студентов, которая включает следующие компоненты: целевой, процессуальный, содержательно-технологический, диагностико-результативный. Предложено использовать процессный

подход для формирования и развития исследовательской компетентности с использованием научных э-конференций. Для каждого процесса определены цели деятельности, средства, формы, методы и компоненты исследовательской компетентности, которые будут сформированы в результате. Разработана система индикаторов для определения уровня исследовательской компетентности по таким группам исследовательских умений: методология, информационный поиск решения проблем, анализ данных, коммуникация – и определены уровни формирования исследовательской компетентности студентов. Представлены этапы подготовки и участия студентов в научных конференциях с применением открытых систем поддержки э-конференций. Предложено примеры э-контента и дополнительных ИК-инструментов для системного формирования исследовательской компетентности студентов и развития цифровой компетентности (ИКТ грамотности). Доказана эффективность использования научных электронных конференций как инструмента формирования исследовательской компетентности студентов, в частности представлены результаты опроса студентов двух университетов по формированию отдельных составляющих исследовательской компетентности. Студенты НУБиП Украины и Киевского университета имени Бориса Гринченко со средним и высоким уровнем исследовательской компетентности отметили позитивное влияние подготовки и участия в научных электронных конференциях на развитие индивидуальных исследовательских умений.

Ключевые слова: научная э-конференция; исследовательская компетентность; открытые системы конференций; образование.



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